

MOTORCYCLE RIDER FATIGUE ANALYSE: RESULTS OF AN ONLINE SURVEY

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ABSTRACT

The motorcycle is one of the easiest transports in India when riding in peak hours, consisted traffic situations and poor roads. Besides easiness motorcycle causes fatigue and pain on the human musculoskeletal system. The study has been taken out through an online questionnaire- based survey to all over India for a period of about one year. This study focuses on four operating modes during riding (throttling, clutching braking and gear shifting). The body parts which are used to involve in operation are wrist, elbow, ankle, and foot. The fatigue due to riding can be divided into two activities with the subjected to the body; one is the body posture while absorbing road shocks for long periods and second is applying the required forces to control the motorcycle. The survey covered five hundred respondents, four hundred and twenty with male and eighty female. The analysis of survey data indicates that all riders are affected by pain on the different part of their body. The result shows a majority of the male and female riders affected by wrist and elbow pain than the ankle and foot. The survey points out the need for ergonomics and dynamic analysis on two-wheelers to provide good ride comfort.

KEYWORDS: Wrist Pain, Questionnaire, Motorcycle Usage & Online Survey

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INTRODUCTION

In a conventional two - wheeler, the throttle control is given by twist movement of the hand. On continuous operation of throttle, the wrist undergoes fatigue which may lead to injury. Hence a study on motorcycle usage and fatigue or pain in India was conducted using a questionnaire- based survey. The survey was carried out across major cities in India. (Sai Praveen Velagapudi, Ray G 2015) discomfort survey shows that majority of users perceive discomfort in parts of their upper body especially the neck, back, buttocks, wrists, and shoulder. (Koumi Dutta, Bibaswan Basu and Devashish Sen 2014) the study shows bike riders are exposed to prolonged static posture causing significant angular deviations at all joints of the body this create unwanted pain and also pain mapping was done by questionnaire method using standardized pain map (10-point subjective scale).

(Karmegam 2009) survey on motorcyclists discomfort in Malaysia was the results indicated that the motorcyclist mainly experienced discomfort on their upper body parts (neck or head, shoulder, upper back, arm and hand, low back and buttock) and whereas majority expressed no discomfort in their lower body part (knee,

calf leg below knee and ankle and feet). This survey is based on questionnaire method. (Floyd J Fowler 1995) highlighted that critical standard for a good question and answer process is that it produces an answer that provides meaningful information about what we are trying to describe. An online survey method was carried out to find that which body part get more pain when using a motorcycle, based on Karmegam(2009), (Koumi Dutta, Bibaswan Basu and Devashish Sen 2014). An online survey is a multiple-choice questionnaire based internet online survey. For this survey, the questionnaire was designed based on general questionnaire method of (Kuorinka et al., 1986). The volunteers of online survey were informed on the aim and objective of this study and they can opt to pull out from this study if they needed or wished to (Koumi Dutta, Bibaswan Basu and Devashish Sen 2014). The survey link (<http://www.esurvey.com>.) was posted on the e-mail, Facebook and Whatsapp based on (Peter M Theuri and Leslie D Turner. 2002) study. Data were collected from October 2014 to January 2016.

METHODS

Population and Sample of the Study

The motorcycle riders from various regions in India have participated in this online survey. This was a questionnaire survey of the self-reported motorcycle rider. A total of 528 people have participated in this survey. Those who were aged fewer than 18 excluded from this survey analysis. 28 participants were fewer than 18 these people's data were not taken into account. Finally, 500 people age between 18-61 years old (mean age=24.63 years, SD=7.17 years) participated data only taken into account in the survey analysis. This questionnaire survey of self-reported motorcycle rider's fatigue or pain and discomfort due to throttling, clutching braking and gear shifting based on (Helmi Rashid et al. 2015).

The Data Collection Instrument

An online survey method was used to collect data within the scope of the study. There are two parts in the survey questionnaire. The first part was to determine the personal information of the motorcyclists participated in the study. In the second part, previous research work by Kuorinka et al. (1987) was adopted with the aim of determining the symptoms of discomforts experienced by the motorcyclists.

The survey was limited to those 18years or older and data from those reporting driven a motorcycle. Data were collected on "E-survey website". Motorcycle riders from various region of India participated in this online survey. This was an observational retrospective survey of self-reported motorcycle riders fatigue and discomfort. An internet- based, multiple-choice logic-driven survey was developed. Totally 528 respondents completed the survey, and submitted their responses. In this survey the subjects were categorized based on the gender. Then they were asked their experiences of riding a motorcycle right from the time of riding, the distances they ride each day, a frequency of their travel, time of their travel, the body part (Wrist, ankle, elbow ,and knee) which experiences the most pain. The question posed was "In a conventional system, the acceleration control is at hand. But this may lead to wrist injuries due to fatigue while driving. One question asked for which part of the Human body do you think experiences fatigue over a period of continuous driving.

RESULTS AND DISCUSSIONS

In the result and discussion, we discussed each question responded by the participants and how many of them answered for the objective type questions. Objective type question's answers were described in percentage. Some of the

question's answers plotted in bar chart Y axis taken a percentage of participants and X- axis taken the choice of objectives of the corresponding question.

Demography of Participants

The online survey 500 was respondents; 420 men and 80 women. Various part of India were participated this survey. Major cities of this survey were Chennai, Mumbai, Kolkata, Delhi, Bangalore, Hyderabad, Ahmadabad, Pune, Coimbatore, Madurai, Vellore, Salem, Villupuram, Kanchipuram, Dharmapuri, Trichy, and Thiruvannamalai. Majority of people were reported from Tamilnadu. Out of 500 people 364 people from Tamilnadu and 136 people from other parts of India. In this survey, the age group (20-25) was identified to have highest (60%) percentage of the motorcyclist. This means in India youngsters would like drive motorcycle for their transport purpose.

Driving Experience of Participants

Participants possessed riding experience shown in the figure. 1. This was categorised less than 1 year, 1 to 5 year, 5 to 10 year and more than 10 years. The participant answered 13 % of participants were having less than one year experience, 36% participants were having 1 to 5- year experience, 35% participants were having 5 to 10- year experience and 16 % of participants were having more than ten -year experience.

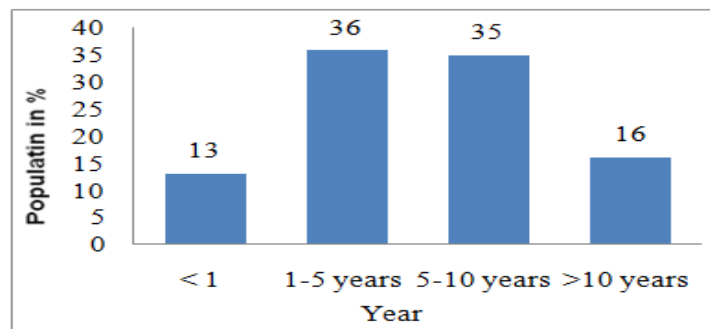


Figure 1: Driving Experience Vs Population

Majority of riders were having 1 to 10 years. This means participants having good experience in motorcycle riding.

Motorcycle Usage of Participants

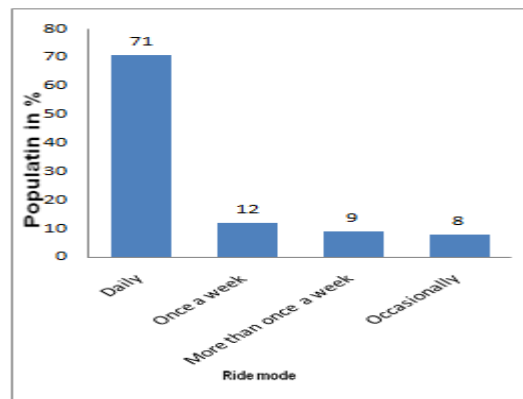


Figure 2: Motorcycle Usage Vs Population

A question “how often do you ride amotorcycle?” asked in the survey. There were four options for this question (Daily, once a week, more than once a week and occasionally). 71% of participants were a daily user of motorcycle for their work. This indicates motorcycles were played major role in Indian people’s day to day activities. In the 71% of participants, 73% participants were riding their motorcycle at peak hours. 12% of participant ride their motorcycle once a week. 9% of participant ride their motorcycle more than once a week and 8% of participant ride their motorcycle occasionally these people were not riding their motorcycle at peak hours also they used motorcycle for personal errands.

Participants Used Motorcycle Engine Capacity

This survey helps to understand about what capacity of engine commonly used and sale in India also helps to understand engine CC prepared age group.

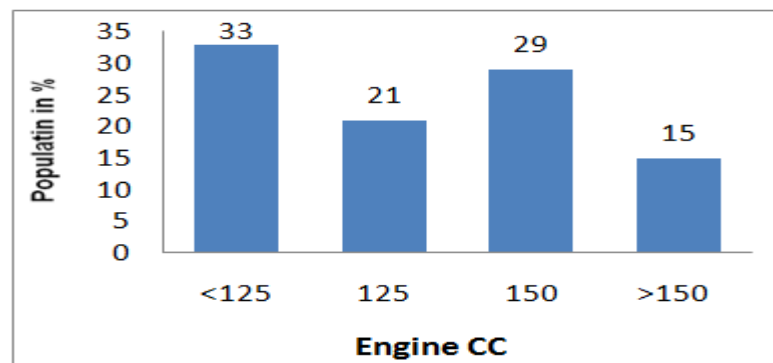


Figure 3: Engine CC Vs Population

Figure. 3 indicated that less than 125 CC motorcycles were 33% of participant used. Second highest was 150 CC motorcycle 29%. 125 CC and greater than 150CC were 21% and 15 %. This survey also revealed that what types of age people ride what types of CC range this is shown in table 1. In this survey woman riders reported they ride less than 125 CC and 125 CC motorcycles they were not prepared 150CC and more than 150 CC because there were two reasons first one is motorcycle weight and the second one is automatic transmission. This result does not mean all woman riders were riding less than 125 CC and 125 CC motorcycles some excepted woman riders were riding 150CC and more than 150 CC motorcycles.

Table 1: Different Age Group Ride Different CC Range

Engine CC	<125	125	150	>150
Total %	34	29	22	15
Range of age	18 - 61	18 - 36	18 - 32	20 - 28
Mean of age	27.55	24.57	23.24	22.53

Table 1. shows less than 125cc motorcycle was driven by age group 18 to 61 this indicates this types of motorcycles were suited for all age groups. Than women rider also prepared this types of motorcycles. 125CC motorcycle ride by age between 18 to 36. 150CC motorcycle prepared age group was 18 to 32 and more than 150 CC motorcycle rise by age group was 20 to 28. This result indicates higher engine CC motorcycle was commonly prepared by youngster age less than 35.

Participants Used Motorcycle Travel Distance

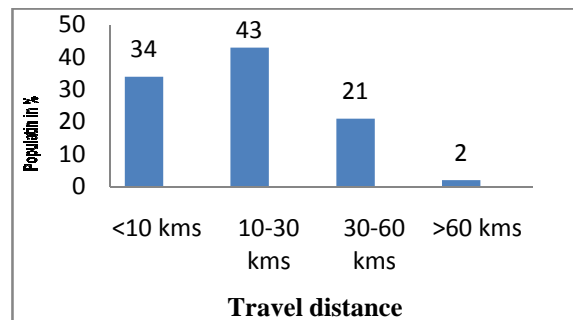


Figure 4: Motorcyclist Travel Distance Vs Population

Figure. 4. Indicates 34 % participant drive motorcycle less than 10 Kms. In this 34 % includes 70 female and 100 male riders. Out off 80 female riders 70 riders were riding less than 10Kms. This means 86% of female riders were riding less than 10Kms. 43% of motorcycle riders were reported to ride a bike 10-30 Km per day. In this 43 % includes 10 female and 205 male riders. Out off 80 female riders 10 riders were riding 10-30 Km per day. This means 14% of female riders were riding 10-30 Km per day. 21% of motorcycle riders were reported to ride bike 30-60 Km per day and only 2% of motorcycle riders were reported to ride bike more than 60 Km per day. Finally, we conclude the majority of female riders motorcycle ride distance was less than 30 Kms. Male riders rode more than 10 Kms.

Reasons for Using Motorcycle

This was a help to understand reasons for using a motorcycle. 25% of participants were used motorcycle to commuting to college or institution day to day. 20% of participants were used the motorcycle to commuting to work day to day. 9% of participants were used a motorcycle to part of their job and the majority of riders were used a motorcycle to personal errands this means 46%. This survey confirms that a motorcycles were predominantly used for personal errands in Indian transports.

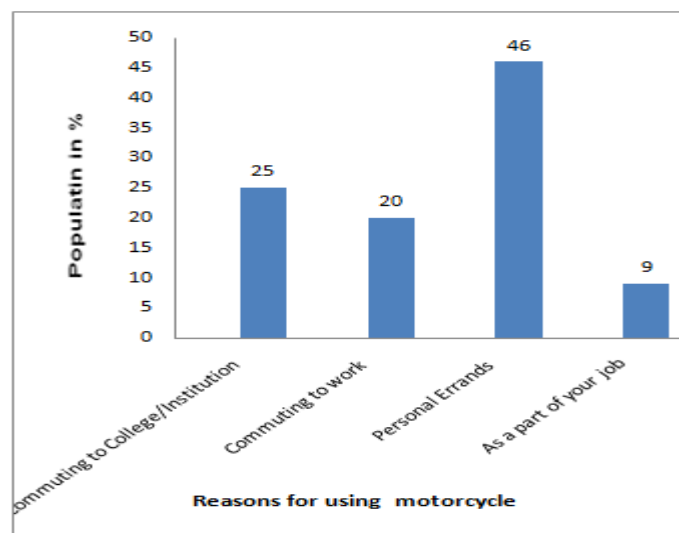


Figure 5: Reasons for Using Motorcycle Vs Population

Participant Prepared Travel Time

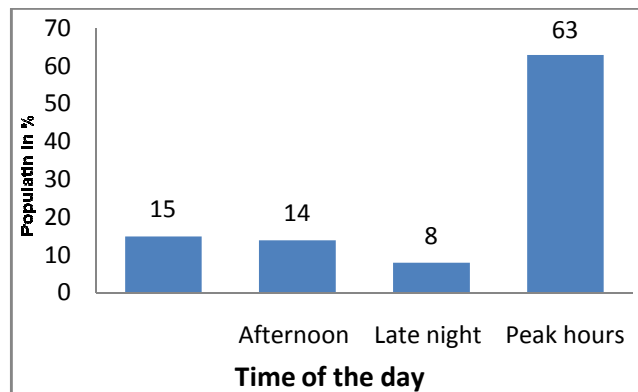


Figure 6: Travel Time Vs Population

Figure. 6. Shows commonly Indian riders drive their motorcycle on road at what time. 15% of people they use motorcycle at early morning. 14% of people ride a motorcycle at afternoon. 8% of people use motorcycle at late night. In India 63% of people use their motorcycle on road at peak hours.

This survey confirms that motorcycles were predominantly used in peak hours in Indian transports total of 63 % of participants rode their motorcycle at peak hours.

Participant Body Part Pain Indication

Figure. 7 presents the percentage of pain experienced by the motorcyclists respectively. The results indicate that 66% of the motorcyclists with having pain on the wrist during the riding process. Wrist pain was common to all age group of a participant in this survey. Majority of riders were feeling wrist pain when riding at peak hours. The reason for wrist pain was traffic then we ride a motorcycle at peak hours normally traffic will occur. In the traffic situation, we continuously change the speed of motorcycle for this reason we have to twist throttle continuously this will cause wrist pain. It is also noticed that there was a small percentage of 18, 9 and 7 of elbow, ankle, and knee respectively from a report about uncomfortable experience of discomforts on their bodies. Further 66% of the riders reported pain in the wrist which is higher than elbow, ankle, and feet. 66% of responded agreed of wrist pain because that question was asked about throttling and wrist pain.

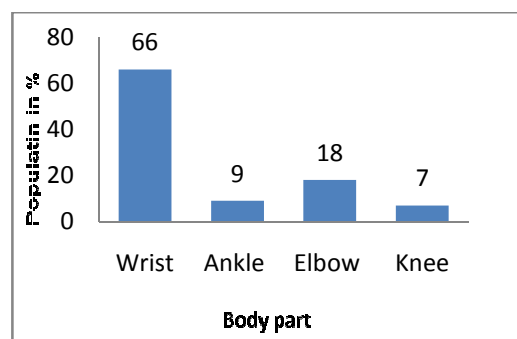


Figure 7: Body Parts Pain Indication Vs Population

The results of this study confirmed that more than half of motorcycle users had pain in the wrist, the pain in the elbow, ankle, and feet are generally lesser than a wrist. This result is in agreed with that of literature (Sai Praveen Velagapudi and Ray G. 2015.), (Koumi Dutta, Bibaswan Basu and Devashish Sen. 2014) and Karmegam (2009)

CONCLUSIONS

This survey is based on questionnaire method. This survey is helpful to understand which body part get pain while driving a motorcycle. Initially, this survey was planned to conduct to identify which body part get more pain while driving a motorcycle. After completing this survey we came to know much useful information about Indian motorcycle riders for examples majority of motorcycle riders used the motorcycle to ride daily activities for commuting to college/ work at peak hours and the majority of motorcycle user were male riders. This survey concludes more than 50% of motorcycle riders suffer from wrist pain while driving a motorcycle.

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